



The Effect of Peppermint Aromatherapy (Mentha Piperita Leaf) On Reducing Post Dural Puncture Headache Pain in Post-Spinal Anesthesia Patients

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Abstract

Background: Post-Dural Puncture Headache (PDPH), as observed clinically, is one of the most common complications of spinal anesthesia. It generally develops within 12-72 hours of the procedure. Though there are pharmacological treatments, these have largely been overshadowed by several tried-and-tested non-pharmacological techniques, which include peppermint aromatherapy, in relieving symptoms of PDPH. **Purpose:** This study was aimed at determining the effectiveness of peppermint aromatherapy in reducing head pain associated with PDPH among post-spinal anesthesia patients at Cilacap Regional General Hospital. **Methods:** A quasi-experimental study design with one group and pretest-posttest design was conducted on 39 patients experiencing PDPH. Pain was measured using the Numeric Rating Scale (NRS) prior to and post-administration of peppermint aromatherapy. The intervention was two drops of peppermint aromatherapy mixed with 100 ml of mineral water and inhaled through the humidifier for 15 minutes. Wilcoxon tests were done for statistical analysis. **Results:** The mean PDPH pain level before the intervention was 5.69. After inhaling peppermint aromatherapy, the mean pain level dropped significantly to 1.64 ($p < 0.05$). The results are interpreted with respect to the significance indicated by this difference in levels while comparing PDPH symptoms before and after treatment with peppermint aromatherapy. **Conclusion:** Hence, peppermint aromatherapy is a highly effective treatment modality for both patients suffering from PDPH and those who have undergone spinal anesthesia. It could be recommended as a non-pharmacological adjunct therapy in the management of PDPH. Further validations of the findings are needed through a larger sample size and controlled groups.

Keywords: peppermint aromatherapy; post-dural puncture headache; spinal anesthesia

Introduction

Post Dural Puncture Headache (PDPH) usually affects the frontal and occipital regions and is experienced after a lumbar block or spinal block. It is caused by the anesthesia needle puncturing the dura mater, causing cerebrospinal fluid to drain. When August Bier initially characterized post-diagnostic or therapeutic headache pain in the spinal or epidural region in 1898, he was referring to post-traumatic headache pain.

Headache pain that usually goes away within 14 days after a dural puncture occurs is known as post-dural puncture headache pain, according to the International Headache Society. When patients shift from a lying position to an upright position, their headache pain increases. This condition is known as orthostatic headache, and PDPH is often associated with this condition. However, PDPH can last longer than this period. Post-dural and epidural anesthesia often causes PDPH as a problem. The process known as lumbar puncture, also called spinal puncture, is to insert a needle through the duramater wall into the subarachnoid space, which contains cerebrospinal fluid in the lumbar region. Lumbar puncture is associated with PDPH, an iatrogenic cause of morbidity. In the UK, the incidence of dural puncture in obstetric practice ranges from 0.18% to 3.6%, with 80% of patients experiencing PDPH. Additional studies conducted in hospitals between 2015 and 2016 provide further information on this subject.

Reference from Felege Hiwot, north west Ethiopia showed that out of 251 patients involved in the study, 107 patients (42.6%) developed PDPH. This study did not find any association between the incidence of PDPH and age, Body Mass Index (BMI), or previous history of PDPH. In 2013, at Dr. Hasan Sadikin Hospital Bandung, a study of 115 pregnant women showed that FMD cases were most

prevalent in 25-30 years of age, with 14 of the 22 patients who tested positive for FMD being in that age range [1].

Anesthesia can be performed by several methods, namely General Anesthesia (GA), Regional Anesthesia (RA), and Local Anesthesia (LA). Regional anesthesia is an analgesia technique that involves injecting local anesthetic drugs around the nerves that control a specific area, thus temporarily blocking the flow of afferent impulses. Spinal anesthesia is often chosen to manage pain during cesarean section, but this method can also cause several complications, including PDPH, which is characterized by headaches in the frontal and occipital regions [2].

Perforation of the dura mater may cause cerebrospinal fluid (CSS) leakage, which will decrease CSS volume and intracranial pressure. A decrease to 4 cmH₂O or less is possible for subarachnoid pressure, which usually varies between 5 and 15 cmH₂O. When using needles larger than 26G, the rate of CSS loss through duramater perforation (0.084-4.5 ml/sec) is much faster than the rate of CSS formation (0.35 ml/min). It is currently unclear what mechanism causes headaches, although the fact that CSS loss and reduced CSS pressure are present is clear. Cerebrospinal fluid is injected into the subarachnoid space, which is reached through the duramater wall, during lumbar puncture, also referred to as spinal puncture. When using a 25-26G spinal needle, the incidence of post-disposition hypotension (PDPH), a typical side effect of spinal anesthesia, is 0.5% - 1%. Although the incidence is relatively low, symptoms of PDPH if not treated properly can be very distressing for patients up to several weeks after surgery. Symptoms of PDPH include headache pain that is mainly felt in the bifrontal and occipital regions, and this pain tends to worsen when the body position is upright. A few hours to a few days (12-72 hours)

after spinal anesthesia is when these headaches often occur [3].

Spinal anesthesia is one of the neuroaxial blocks by entering local or adjuvant anesthetic drugs into the subarachnoid cavity, a complication in spinal anesthesia is the appearance of PDPH after 12-72 hours post-spinal anesthesia. PDPH can be measured using the Numeric Rating Scale, Patients with headache due to spinal stabbing can be treated with pharmacological and non-pharmacological approaches. Pharmacological therapy involves the administration of analgesic drugs, while non-pharmacological therapy includes various methods to prevent and reduce symptoms of nausea and vomiting and post-spinal anesthesia headache can be given peppermint aromatherapy [4].

Previous researcher Mardalena (2023), said that aromatherapy can reduce pain in PDPH. Eight participants (77.7%) of the 36 participants in the aromatherapy group reported experiencing some discomfort, while another eight respondents (22.3%) reported no pain at all. This finding comes from analyzing the data of this study. In this study, participants were instructed to inhale the aromatherapy during the administration of the spinal anesthetic needle through the nose at a distance of 5 cm after three drops were applied to a piece of cotton measuring 6 cm x 5 cm. This finding is in accordance with the study of Anwar, Astuti, and Bangsawan (2018), which showed that before the administration of lavender aromatherapy, the average pain scale was 6.92, while after lavender aromatherapy was given, the average pain scale decreased to 3.85. In addition, researchers according to (5) also explored the difference between 26G and 27G Quincke-type needles in relation to PDPH [7]

Using essential oils for therapy or treatment is known as aromatherapy. Reducing stress and discomfort, improving

coping skills, and encouraging relaxation are the main benefits of this treatment [6]. In aromatherapy, psychological problems and comfort difficulties including pain, sadness, and anxiety can be treated by using essential oils that are thought to help reduce or cure these conditions [7]. The peppermint plant is one of the plant sources used in aromatherapy, among other sources. One type of aromatherapy that can help relieve tense muscles, ease indigestion, reduce the likelihood of nausea and vomiting, and help those who cannot pass gas is aromatherapy made from peppermint plant material [8].

Numeric Rating Scale (NRS) is one of the commonly used pain measurement methods. Patients over the age of 9 can use this scale. When starting therapy, or regularly thereafter, the degree of pain can be assessed. To measure their degree of pain, patients are asked to give a number between 0 and 10. Higher numbers indicate higher pain severity. There are five different pain levels: zero indicates no pain, three to ten indicates mild pain, four to six indicates moderate pain, seven to nine indicates severe pain, and ten indicates very severe pain.

Material and Methods

The research design was One Group Pretest-Posttest Design. This study was conducted at Cilacap Regional General Hospital from July to August 2024. The population studied was post-spinal anesthesia patients, and the sample in this study were patients who experienced PDPH. The sampling technique was 39 patients. This researcher has been approved by the ethics committee with letter number No.B.LPPMUHB/645/07/2024. The materials and tools used in this study are Numeric Rating Scale (NRS), humidifier, peppermint aromatherapy. The data collection technique in this study involved direct observation and interviews. This data

analysis technique uses bivariate analysis techniques.

This researcher must first find out that the patient is using spinal anesthesia, after the researcher knows the next interview whether the patient is experiencing PDPH pain according to the characteristics of PDPH, if the patient experiences PDPH pain, ask the patient what the patient's pain level score is, give peppermint aromatherapy to the patient for 15 minutes, The aromatherapy given is enough with 2 drops of peppermint aromatherapy mixed with 100ml of mineral water which is put into a humidifier, giving this aromatherapy by evaporating with a humidifier, if aromatherapy has been given to the patient for 15 minutes, conduct an interview to find out the score of the patient's pain level, the last step is to compare before and after being given aromatherapy whether the patient's PDPH pain level is reduced.

Results

The results in a study conducted on 39 post-spinal anesthesia patients at Cilacap Regional Hospital whose purpose was to see a decrease in the level of Post Dural Puncture Headache pain before and after the administration of peppermint aromatherapy. This study began in the pre-anesthesia phase to review the criteria for inclusion of participants and their consent, then continued in the postoperative phase to carry out the study, the findings are

Table 1. Characteristics of respondents who experienced PDPH

Characteristics	f	%
Age		
< 20	2	5.1
20-29	10	25.6
30-39	15	38.5
40-49	8	20.5
50-59	4	10.3
Total	39	100,0
Gender		

Male	19	48,7
Female	20	51,3
Total	39	100,0
Needle Size		
25	33	84,6
26	6	15,4
Total	39	100,0

Table 4.1 shows that the age of the majority of participants is in the age range of 30-39 years, 15 people (38.5%). The gender of the majority of participants was female, 20 participants (51.3%). Then the needle number spinocan commonly used in spinal anesthesia is 25G Quincke, 33 people (84.6%) experienced PDPH.

Table 2. Normality Test (Shapiro Wilk)

PDPH Level	df	P value
Before aromatherapy	39	0.000
After aromatherapy	39	0.000

In the paired test and independent t test, a normality test is required on the data. The normality test will be assessed by Kolmogorov Smirnov. If $p > 0.05$ then the data is normal. If the p-value < 0.05 then the data is not normal, then the analysis becomes non-parametric using Wilcoxon. Based on the normality test assessed by Shapiro Wilk on PDPH data before and after being given peppermint aromatherapy, the results obtained with a value (p) of $0.000 < 0.05$, the data distribution is not normal, so the analysis becomes non-parametric using Wilcoxon.

Table 3. Effect of peppermint aromatherapy on reducing PDPH pain

PDPH Level	Aromaterapi Peppermint		P value
	Mean	SD	
Before aromatherapy	5.69	4.498	0.000
Before aromatherapy	1.64	2.826	
Difference	4,05		

Based on the statistical test, the Wilcoxon test obtained p value < 0.05 and

the average PDPH level before therapy was 5.69. The average PDPH level after therapy is 1.64. so it can be concluded that peppermint aromatherapy has an effect on reducing the PDPH level of post-spinal anesthesia patients

Discussions

Characteristics of Respondents. The findings of the study refer to the age of the majority of participants in the age range of 30-39 years, 15 participants (38.5%). The gender of the majority of participants was female, 20 participants (51.3%) and the needle number of spinal commonly used in spinal anesthesia is 25G Quincke number 33 participants (84.6%) experienced PDPH.

The composition of respondents in this study is the majority of the age range 30-39 years. The study of [7], that most participants aged 30-39 years experienced PDPH, with 18 participants (39.1%) in that age group. His findings are consistent with previous studies that indicate that physiological, anatomical, and psychological conditions are best in the productive age range of 18 to 40 years. Older ages (50 years and above) tend to experience headache discomfort after spinal anesthesia due to decreased cranial dura flexibility, whereas younger ages tend to have greater cranial dura elasticity [8]. In line with research by [9] the incidence was higher between the ages of 31 and 50 years. PDPH above the age of 60 years is rare, and studies have shown a consistent decrease in the incidence of PDPH with age.

Her findings are in agreement with [8], which said that women made up the majority of respondents with PDPH. A higher likelihood of headache after spinal anesthesia is associated with female gender. Cerebrospinal fluid leaking from the dural orifice can theoretically increase in obstetric patients if there is a decrease in intra-abdominal pressure shortly after birth, thus decreasing epidural pressure.

(Jenkinson, 2019). The study of Siagian et al. (2021) indicated that headache is a frequent side effect after spinal anesthesia surgery, with a greater frequency in women (22.58%) than men. [11] indicated that activation of the contralateral prefrontal cortex in women is more active, which may accelerate the experience of pain. Women often react to pain stimuli more strongly than men. Estrogen in women may also cause blood vessels to dilate, which increases the likelihood of headaches.

The use of spinocain needles in spinal anesthesia procedures varies. The spinocain needles used in the study were 25G and 26G needles with the Quincke type. This is in accordance with the study of [8] which said that most of them used 26 G and 27 G needles. this is because the use of spinocain needle size affects the increase in PDPH [9]. This is in accordance with the study of [10] who said that most of those who experienced PDPH used a 25G needle size. In theory, it is possible that larger conventional needle sizes, or smaller needle sizes, are associated with an increased incidence of post-traumatic pressure headache (PDPH) because the risk of PDPH is increased by puncturing the dura mater [11].

The effect of peppermint aromatherapy on reducing PDPH pain at Cilacap Regional Hospital. The findings of the Wilcoxon test obtained p value <0.05 and the average PDPH level before therapy was 5.69. The average PDPH level after therapy is 1.64. so the conclusion is that peppermint aromatherapy has an effect on reducing the PDPH level of post-spinal anesthesia patients. There is conformity with the study of [12] The study shows that in the intervention group, there is a significant difference between the level of pain before and after using peppermint aromatherapy, with a decrease in pain magnitude of 4.00. This can be seen from the value P (<0.05), showing the

effectiveness of aromatherapy in reducing discomfort. Apart from its skincare benefits, aromatherapy also reduces stress and fatigue and promotes general well-being. Mood, fatigue, worry, and relaxation can be improved with essential oils [13-15]. Essential oils stimulate the olfactory nerve, which impacts the brain and nervous system when inhaled. Certain medicinal, psychological, and physiological qualities of essential oils derived from various plant components, including flowers, fruits, barks, grasses, and seeds, may support and prevent disease [13]. The study [16-19] also mentioned that essential oils can relieve muscle tension due to excessive fatigue. The neurological system associated with the sense of smell in the brain can be affected by essential oils, as can nerve impulses and reflexes at nerve receptor endings in the deeper layers of the skin [20-21]. Neurotransmitters associated with the restoration of mental states, such as emotions, feelings, thoughts, and desires, may be produced in greater amounts in the brain as a result of these reactions. The findings of this study are in agreement with the study of reported on the positive effect of peppermint essence in reducing pain after appendectomy surgery.

Limitation

A few limitations associated with this study are given here. When there is only one group in the One Group Pretest-Posttest Design, then it is not possible to attribute the effects purely to peppermint aromatherapy. Furthermore, the sample size is 39 and was conducted at Cilacap Regional General Hospital; thus, it is a single-center study so that findings will not generalize too well. The short time for following up does not allow any conclusions regarding its long-term efficacy. The study also had some potential covariates not controlled for, such as hydration status, using analgesics

concurrently, and individual pain threshold. Future research may proceed with a randomized controlled trial and a large sample drawn from several hospitals and with a longer follow-up to make it valid and applicable.

Conclusion

Based on statistical tests, the Wilcoxon test obtained a p-value <0.05 and the average PDPH level before therapy was 5.69. The average PDPH pain level after therapy is 1.64. This is because peppermint aromatherapy has an effect in reducing the PDPH pain of post-spinal anesthesia patients.

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Conflict of Interest Statement

The authors have confirmed that they have no competing interests.

Data Availability

The datasets used or generated in this study are available from the corresponding author upon reasonable request.

Author Contributions

Riski Ardi Saputro: Conception and design of the study, Search Data Base, Methodology, Analysis Risk of Bias, Data Analysis and Interpretation, Writing, Review and Editing. **Made Suandika:** Study conception and design, search database, methodology, data analysis, and

interpretation, and writing, review, and editing.

Wilis Sukmaningtyas:

Conception and design of the study, Search Database, Methodology, Data Analysis, and Interpretation, Writing, Review, and Editing.

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